IN THE CLAIMS:

1. (Currently Amended) A method of processing non-binary symbols of a block

code comprising:

      receiving a sequence of symbols in the block code; and

      determining a soft value for each non-binary symbol using a binary trellis and a

predetermined soft output Viterbi algorithm (SOVA) traceback window that is sized based

on channel convergence and the number of bits per symbol.

2. (Original) The method of claim 1 wherein determining further comprises:

      determining a hard decision for each symbol by determining a best symbol candidate

and a second best symbol candidate for each symbol.

3. (Original) The method of claim 2 wherein determining further comprises:

      determining a soft probability value for each of the best and second best symbol

candidates for each symbol.

4. (Currently Amended) The method of claim 3 wherein each symbol comprises Z-bits

and wherein determining the hard decision for each symbol comprises:

      determining a most likely path for thea predetermined soft output Viterbi algorithm

(SOVA) traceback window;

      determining the best symbol candidate for the symbol by grouping bit decisions for a

first Z-bits on the most likely path; and

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determining the second best symbol candidate for the symbol by grouping bit

decisions for a first Z-bits on a second best path competing with the most likely path.

5. (Original) The method of claim 4 wherein determining a soft probability value for each

of the best and second best symbol candidates comprises:

computing a soft decision as the minimum of path metric differences of all paths

competing with the most likely path and providing a different decision on any one of the Z-

bits in the symbol;

computing a first soft probability value for the best symbol candidate based on the

computed soft decision; and

using the first soft probability value to compute a second soft probability value for

the second best symbol candidate.

6. (Currently Amended) The method of claim 1 wherein each symbol comprises Z-bits and

wherein determining comprises:

using as thea predetermined SOVA traceback window a window that has a size that

is greater than Z-bits.

7. (Currently Amended) The method of claim 6 wherein the predetermined SOVA

traceback window size comprises a multiple of Z-bits, with the multiple based on the

channel convergence.

8. (Original) The method of claim 1 wherein receiving comprises receiving the sequence

of symbols from an inter-symbol interference (ISI) channel.

9. (Original) The method of claim 8 wherein the ISI channel comprises magnetic storage media.

10. (Original) The method of claim 9 wherein the sequence of symbols comprises a Reed-Solomon codeword.

11. (Original) The method of claim 10 further comprising:

providing each soft value to a Reed-Solomon decoder for use in decoding the

symbol for which such soft value was determined.

12. (Original) The method of claim 10 further comprising:
using each soft value during a data recovery process.

13. (Original) The method of claim 1 wherein the sequence of symbols comprises a

convolutional coded sequence.

14. (Original) The method of claim 1 further comprising:

receiving most likely path information from a hard decision Viterbi detector.

15. (Currently Amended) The method of claim 14 wherein determining comprises using

thea predetermined SOVA traceback window with a ef bit length W and wherein memory

requirements in bits for storing b-bit path metric differences comprises W*b.

16. (Original) The method of claim 14 wherein only a current value of path metric

difference is maintained for each symbol determination.

17. (Currently Amended) An article comprising:

    a storage medium having stored thereon instructions that when executed by a

machine result in the following:

        receiving a sequence of <u>non-binary</u> symbols in a block code; and

        determining a soft value for each <u>non-binary</u> symbol using a binary trellis <u>and a</u>

<u>predetermined soft output Viterbi algorithm (SOVA) traceback window that is sized based</u>

<u>on channel convergence and the number of bits per symbol</u>.

18. (Currently Amended) An apparatus comprising:

    means for receiving a sequence of <u>non-binary</u> symbols in a block code; and

    means for determining a soft value for each <u>non-binary</u> symbol using a binary

trellis <u>and a predetermined soft output Viterbi algorithm (SOVA) traceback window that is</u>

<u>sized based on channel convergence and the number of bits per symbol</u>.

19. (Currently Amended) An apparatus comprising:

    circuitry to receive a sequence of <u>non-binary</u> symbols in a block code and process

the sequence of <u>non-binary</u> symbols based on a binary trellis <u>and a predetermined soft</u>

<u>output Viterbi algorithm (SOVA) traceback window that is sized based on channel</u>

<u>convergence and the number of bits per symbol</u>; and

    a soft output evaluation unit, coupled to the circuitry and responsive to the symbol

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processing, to determine a soft value for each symbol.

20. (Original) The apparatus of claim 19 wherein the soft output evaluation unit is

operative to determine a hard decision for each symbol by determining a best symbol

candidate and a second best symbol candidate for each symbol.

21. (Original) The apparatus of claim 20 wherein the soft output evaluation unit is operative

to determine a soft probability value for each of the best and second best symbol candidates

for each symbol.

22. (Currently Amended) The apparatus of claim 21 wherein each symbol comprises Z-

bits and wherein the soft output evaluation unit determines the hard decision for each

symbol by:

determining a most likely path for a the predetermined soft output Viterbi algorithm

(SOVA) traceback window;

determining the best symbol candidate for the symbol by grouping bit decisions for a

first Z-bits on the most likely path; and

determining the second best symbol candidate for the symbol by grouping bit

decisions for a first Z-bits on a second best path competing with the most likely path.

23. (Original) The apparatus of claim 22 wherein the soft output evaluation unit determines

the soft probability value for each of the best and second best symbol candidates by:

computing a soft decision as the minimum of path metric differences of all paths

competing with the most likely path and providing a different decision on any one of the Z-bits in the symbol;

computing a first soft probability value for the best symbol candidate based on the computed soft decision; and

using the first soft probability value to compute a second soft probability value for the second best symbol candidate.

24. (Currently Amended)   The apparatus of claim 19 wherein each symbol comprises Z-bits and wherein the soft output evaluation units determines the soft decisions by using a as the predetermined SOVA traceback window a window that has a size that is greater than Z-bits.

25. (Currently Amended)   The apparatus of claim 24 wherein the predetermined SOVA traceback window size comprises a multiple of Z-bits, with the multiple based on the channel convergence.

26. (Original)   The apparatus of claim 19 wherein the circuitry is operative to receive the symbols from an inter-symbol interference (ISI) channel.

27. (Original)   The apparatus of claim 26 wherein the ISI channel comprises magnetic storage media.

28. (Original)   The apparatus of claim 27 wherein the symbols comprise a Reed-Solomon codeword.

29. (Original) The apparatus of claim 28 wherein the soft output evaluation unit is operative to provide each soft value to a Reed-Solomon decoder for use in decoding the symbol for which such soft value was determined.

30. (Original) The apparatus of claim 19 wherein the sequence of symbols comprise a convolutional coded sequence.

31. (Original) The apparatus of claim 19 wherein the circuitry is coupled to a hard decision Viterbi detector and receives most likely path information from the hard decision Viterbi detector.

32. (Currently Amended) The apparatus of claim 31 wherein the soft output evaluation unit determines the soft decisions using a-as the predetermined SOVA traceback window a window of bit length W and wherein the circuitry is configured to store b-bit path metric difference values in a memory of W*b bits.

33. (Original) The apparatus of claim 31 wherein the circuitry is configured to maintain only a current value of path metric difference for each symbol determination.

34. (Currently Amended) A detector comprising:

        a hard decision Viterbi detector to determine hard decisions on non-binary symbols in a codeword; and

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a SOVA detector, coupled to the hard decision Viterbi detector, to receive most likely path information from the hard decision Viterbi detector and use the most likely path information to determine a soft value for each corresponding non-binary symbol.

35. (Currently Amended) A system comprising:

a data channel;

a storage controller, coupled to the data channel, to read codewords of non-binary symbols from the data channel, the storage controller comprising a SOVA device to determine a soft value for each non-binary symbol using a binary trellis and a predetermined soft output Viterbi algorithm (SOVA) traceback window that is sized based on channel convergence and the number of bits per symbol.

36. (Original) The system of claim 35 further comprising:

a hard decision Viterbi detector to determine hard decisions on each symbol; and

wherein the SOVA device is configured to receive most likely path information from the hard decision Viterbi detector and use the most likely path information to determine the soft value for each corresponding symbol.

37. (Original) The system of claim 36 wherein the data channel comprises a magnetic storage medium.

38. (Original) The system of claim 37 further comprising:

a hardware decoder;

wherein the hard decision Viterbi detector resides in the hardware decoder; and

wherein the SOVA device is a SOVA detector implemented in software, configured

to operate as part of a data recovery operation.

39. (Currently Amended) A system comprising:

a hard decision Viterbi detector to determine hard decisions for symbols received

from a data channel; and

a SOVA detector, coupled to the hard decision Viterbi detector, configured to

receive most likely path information from the hard decision Viterbi detector and use the

most likely path information to determine the bit-level soft value for each bit using a

traceback operation for competing paths along the most likely path.